Dental Waterline Quality Assurance – Responding to the CDC Health Advisory

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Dr. Shannon E. Mills Biography

- Dr. Mills is a healthcare consultant and lecturer based in Concord, New Hampshire. He graduated from Baylor College of Dentistry and was commissioned as a Dental Officer in the United States Air Force. He completed a general dentistry residency at Wilford Hall USAF Medical Center. He retired as a Colonel in 2005 and is currently working with the CDC as a subject matter expert on infection prevention in dental settings.
- Dr. Mills was the editor of the Organization for Safety Asepsis and Prevention (OSAP) *Dental Waterline White Paper and Recommendations*. He is involved in development of dental industry standards as a member of ADA/American National Standards Institute Standards Committees for Dental Products and Dental Informatics and is a member of the US Technical Advisory Group to the International Organization for Standardization - Dentistry.
- Dr. Mills is the author of the ADA's *Practical Guide to Effective Infection Prevention and Control*.

Disclosures

I am currently employed by Cyberdata Inc. as a contract subject matter expert for the Centers for Disease Control and Prevention (CDC) Division of Oral Health.

I am not serving in the capacity of spokesperson for the CDC and the information and opinions expressed in this presentation do not necessarily reflect the official position of the CDC, or Cyberdata.

The appearance of commercial products in this presentation are uncompensated, do not constitute endorsement, and are provided for instructional purposes only.

Learning Objectives

- 1. Describe outbreaks of pediatric non-tuberculous mycobacterial infections associated with dental waterlines and other medical equipment
- 2. Explain how biofilms form in dental water delivery systems and other medical devices
- 3. Explore options for managing the quality of water provided by dental units
- 4. Compare best practices for clinical irrigation for surgical and non-surgical dental procedures

Estimate of Burden and Direct Healthcare Cost of Infectious Waterborne Disease in the United States (2014)

- Safe drinking water in the United States is a great public health achievement.
- Due aging infrastructure, chlorine-tolerant and biofilm-related pathogens, increased recreational water use ~ 7.15 million waterborne illnesses occur annually causing 601,000 ED visits, 118,000 hospitalizations, and 6,630 deaths
- US Direct healthcare costs estimated at US $2.39 billion annually:
  - Otitis externa and norovirus infection were the most common illnesses
  - Most hospitalizations and deaths caused by biofilm-associated pathogens (nontuberculous mycobacteria (NTM), Pseudomonas, Legionella)

Collier SA, Deng L, Adam EA, et al. Estimate of Burden and Direct Healthcare Cost of Infectious Waterborne Disease in the United States. Emerging Infectious Diseases. 2021;27(1):140-149. doi:10.3201/eid2701.190676.

Domestic water challenges

- There are 6 million miles of “premise plumbing” inside US buildings used for drinking, sanitation, hygiene, cooling, and heating
- Water quality compromised by long water residency times, reduced disinfectant levels, and inadequate hot water temperatures, favoring growth of pathogens
- NTM, Pseudomonas, and Legionella amplify in biofilms and expose people by contact, ingestion, or inhalation of aerosols (e.g., from showerheads, building cooling towers, decorative fountains and medical devices).

Healthcare Outbreaks Associated With Water

- Hospital water serves as a reservoir of healthcare-associated pathogens, and contaminated water can lead to outbreaks and severe infections.
- Waterborne pathogens include Legionella and other gram-negative bacteria, nontuberculous mycobacteria, fungi and viruses.
- Infections include bacteremia and invasive and disseminated diseases, particularly in immunocompromised and critically ill adults as well as neonates.

Kanamori H, Weber D, Rutala W. Clinical Infectious Diseases, Volume 62, Issue 11, 1 June 2016, Pages 1423–1435, 2
Published: 01 March 2016

Health Alert

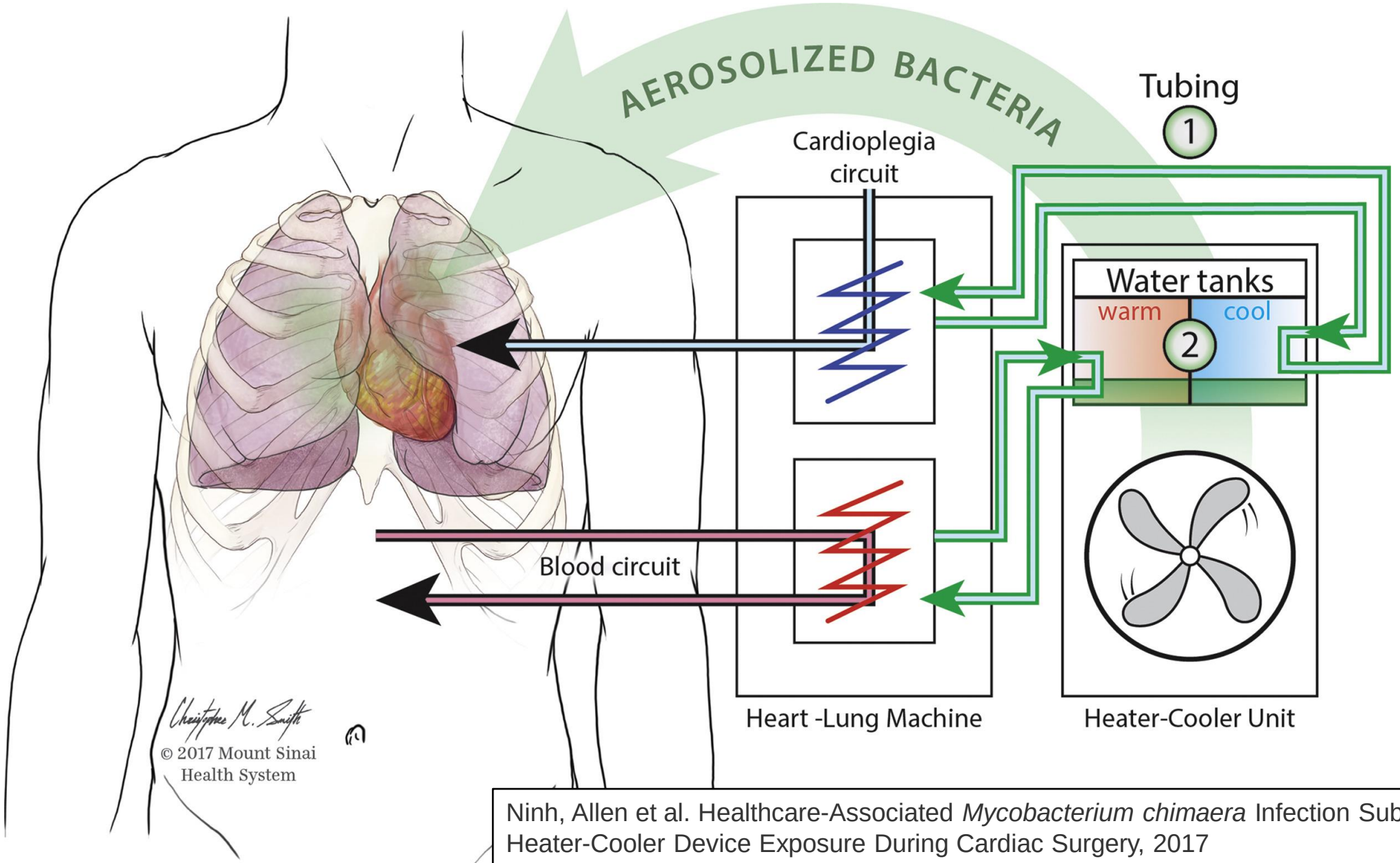
- CDC has warned hospitals and patients about the potential risk of Nontuberculous Mycobacteria (NTM) infections from certain heater-cooler devices used during open heart (open-chest) surgery.

Heater Cooler Units (HCU)

- Water tanks provide temperature-controlled water to external heat exchangers or to warming/cooling blankets through closed water circuits.

- HCU do not directly contact patients, but NTM contaminated water can be dispersed as aerosols into the operating room air and the open surgical cavity.

- NTM bacteria can form biofilm in tanks and lines in HCU and water agitation by pumps, mixing components, return circuit water, etc., may increase the potential for aerosolization of NTM bacteria.



Ninh, Allen et al. Healthcare-Associated *Mycobacterium chimaera* Infection Subsequent to Heater-Cooler Device Exposure During Cardiac Surgery, 2017
Journal of Cardiothoracic and Vascular Anesthesia, Volume 31, Issue 5, 1831 - 1835

CDC Health Advisory

Outbreaks of Nontuberculous *Mycobacteria* Infections Highlight Importance of Maintaining and Monitoring Dental Waterlines

Print

HAN HEALTH ALERT NETWORK

This is an official CDC HEALTH ADVISORY

Distributed via the CDC Health Alert Network
October 31, 2022, 1:00 PM ET
CDCHAN-00478

National News Coverage

HAN
HEALTH ALERT NETWORK

UPI

Dentists' water lines linked to rare bacterial infections, CDC warns

By Steven Reinberg, HealthDay News

NEWS POLITICS U.S. NEWS WORLD CULTURE AND TRENDS BUSINESS TECH HEALTH OPINION WATCH NOW

U.S. NEWS

CDC warns of bacteria in dental waterlines after children are infected

Two outbreaks of nontuberculous Mycobacteria infections were linked to pediatric dental offices in 2015 and 2016, with another suspected in March.

Summary

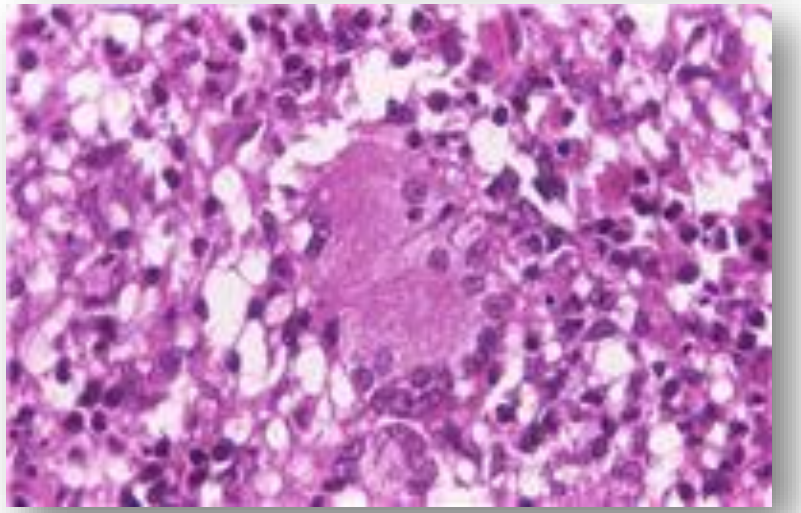
- CDC HAN Health Advisory emphasizes following existing recommendations for maintaining and monitoring dental waterlines.
- Multiple outbreaks of nontuberculous Mycobacteria (NTM) infections have occurred in children who received pulpotomies in pediatric dental clinics where the dental treatment water contained high levels of bacteria.
- CDC provides recommendations to treat dental unit waterlines and monitor water quality.
- Dental providers should be familiar with these recommendations on how to properly maintain and monitor their dental equipment to ensure that dental treatment water is safe for patient care.

Jonesboro Georgia, 2014-2015

- Sept 2015: Georgia Department of Public Health notified of of 9 pediatric *Mycobacterium abscessus* odontogenic infections
- Symptom onset 3 to 180 days after treatment
- All children had pulpotomies at the same pediatric dental clinic
- Facility plumbing system was contaminated with *M. abscessus*
- Dental practice used tap water in their DUWL and did not follow manufacturer's recommendations for daily disinfection of DUWL or monitor water quality.

Diagnosis and Treatment

- Clinical diagnoses included:
  - Cervical lymphadenitis (24 of 24)
  - Mandibular or maxillary osteomyelitis (11 of 23)
  - Pulmonary nodules (7 of 19)
- No deaths. Each child had at least 1 hospitalization and a median of 2 surgeries (range, 1-6).
  - 12 (50%) had surgery alone
  - 11 (46%) received intravenous (IV) antibiotics



Hatzenbuehler LA; J Pediatric Infect Dis Soc. 2017 Sep 1;6(3):e116-e122.

Treatment Complications

- Nineteen patients (79%) experienced treatment complications including:
  - Vascular access malfunction (7 of 11)
  - High-frequency hearing loss (5 of 9) due to antibiotic toxicity
  - Permanent tooth loss (11 of 23)
  - Facial nerve palsy (7 of 24)

Hatzenbuehler LA; J Pediatric Infect Dis Soc. 2017 Sep 1;6(3):e116-e122.

Anaheim California 2016 -2017

- September 2016: Orange County Health Care Agency (OCHCA) reported 67 cases of slowly progressive oral cellulitis consistent with mycobacterial infection in children ages 2-11
- All had received pulpotomies at the same dental clinic between February 4 and August 20, 2016
  - 20 had *Mycobacterium abscessus*
  - 1 had *M. chelonae*
  - 46 were probable cases based on symptoms

Anaheim California 2016 - 2017

- Dental office plumbing water used for treatment was positive for NTM similar to *M.chelonae/abscessus* associated with 1 confirmed and 9 probable infections.
- Samples from DUWL ranged from 600 -16,000 CFU/mL.
- Although the outbreak strain was not found at time of sampling by CDC, OCHCA concluded the outbreak was associated with insufficient treatment of DUWL output water.
- This is not surprising since species and strains of biofilm bacteria are constantly undergoing succession.

Diagnosis and Treatment

- Case report (2020): 108 of 1000+ children at risk for *M. abscessus* infection evaluated based on symptoms and CT scan
  - 90 required at least 1 surgery; 5 had 2 surgeries
  - 11 patients aged 3 to 8 years required cervical lymphadenectomy
  - 6 had concurrent pulmonary nodules.

A Zhukhovitskaya et al, Int J Pediatr Otorhinolaryngol . 2020 Apr;131:109882.

New Cluster Reported - 2022

- In March 2022, CDC was notified of a new cluster of suspected NTM infections in children following dental procedures at a10 chair pediatric dental clinic.
- Investigation into this cluster is currently ongoing, and preliminary site visit data report that dental unit waterline testing results showed microbial counts much higher than the level recommended by CDC.

Second Georgia Outbreak - 2022

- March 2022 – CDC identified cluster of suspected NTM infections in a Georgia dental facility.
- 13 children ages 5 -10 years old
- Cases reported May 2021 – November 2021
- No specific patient isolates had been identified
- In all cases, surgical procedures were required to resolve infections

Initial Sampling Results – 4/1/2022

HETERTROPHIC PLATE COUNT

% Positive

93% --- 55 of 59 potable water samples

- > 500 CFU/ml = 19 (32%)

Range: 10 – 24,000 CFU/ml

MYCOBACTERIA

% Positive

95% --- 56 of 59 water samples

Range: <10 – 1,150 CFU/ml

Second Sampling Results – 4/29/2022

HETERTROPHIC PLATE COUNT

% Positive

42% --- 23 of 55 water samples

- > 500 CFU/ml = 3 (5%)

Range: 10 – 790 CFU/ml

*** Flushing and monochloramine treatment implemented for 1 week

MYCOBACTERIA

% Positive

38% --- 21 of 55 water samples

Range: <10 – 250 CFU/ml

Ongoing Sampling Results – 12/20/2022

HETERTROPHIC PLATE COUNT

% Positive

12% --- 2 of 17 water samples

- > 500 CFU/ml = 0

Range: 10 – 790 CFU/ml

*** Flushing, monochloramine treatment and addressed findings of RA (~ 8 months)

MYCOBACTERIA

% Positive

0% --- 0 of 17 water samples

Range: <10 – 250 CFU/ml

Adult NTM Post Operative Infections (Venezuela 2020)

- Three patients with a facial cutaneous sinus tract of dental origin, due to NTM infection (*M. fortuitum, M. abscessus and M. peregrinum)*.
- The infection source was the DUWL, colonized with NTM.

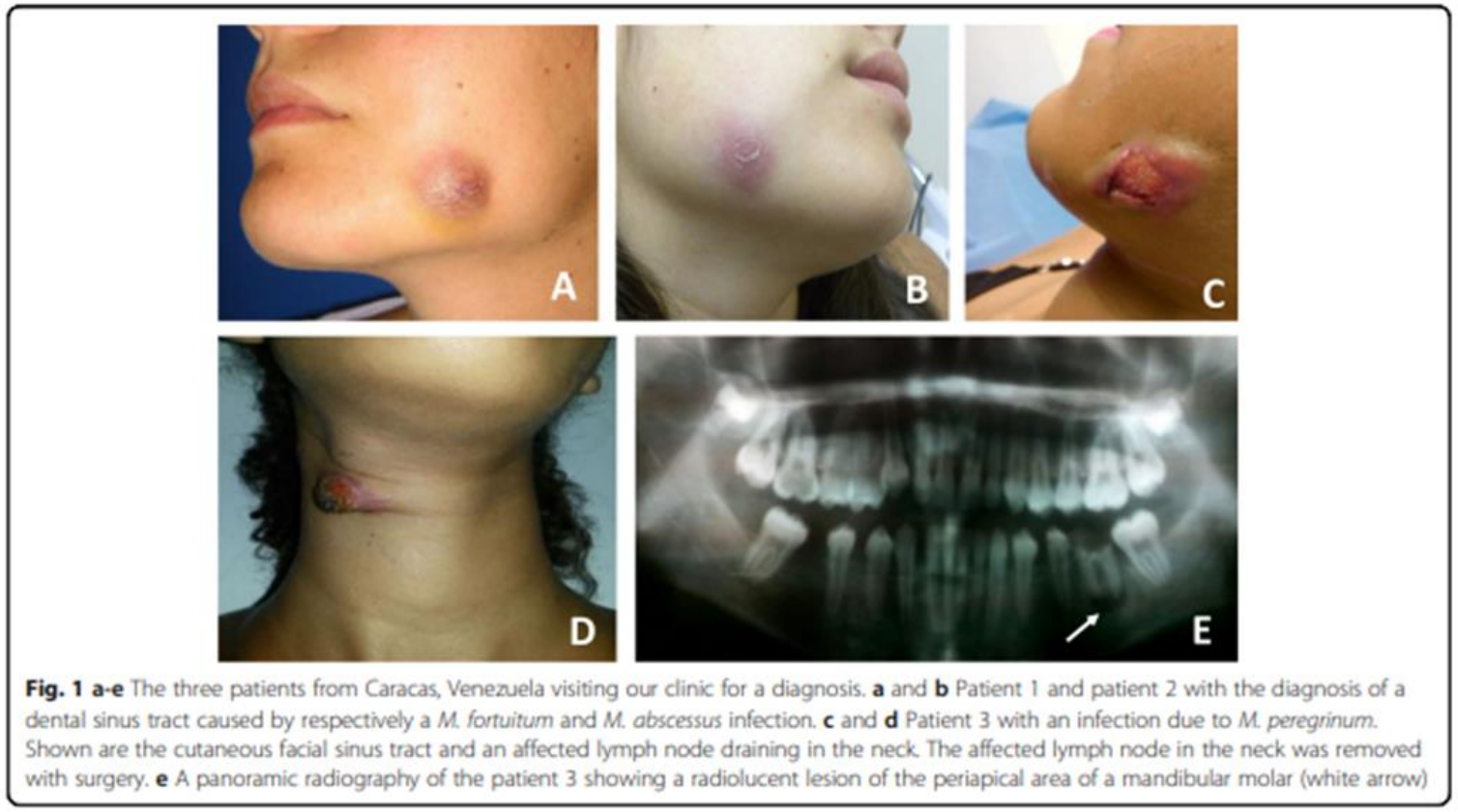


Fig. 1 a-e The three patients from Caracas, Venezuela visiting our clinic for a diagnosis. **a** and **b** Patient 1 and patient 2 with the diagnosis of a dental sinus tract caused by respectively a *M. fortuitum* and *M. abscessus* infection. **c** and **d** Patient 3 with an infection due to *M. peregrinum*. Shown are the cutaneous facial sinus tract and an affected lymph node draining in the neck. The affected lymph node in the neck was removed with surgery. **e** A panoramic radiography of the patient 3 showing a radiolucent lesion of the periapical area of a mandibular molar (white arrow)

Pérez-Alfonzo et al. BMC Infectious Diseases (2020) 20:295 https://doi.org/10.1186/s12879-020-05015-5

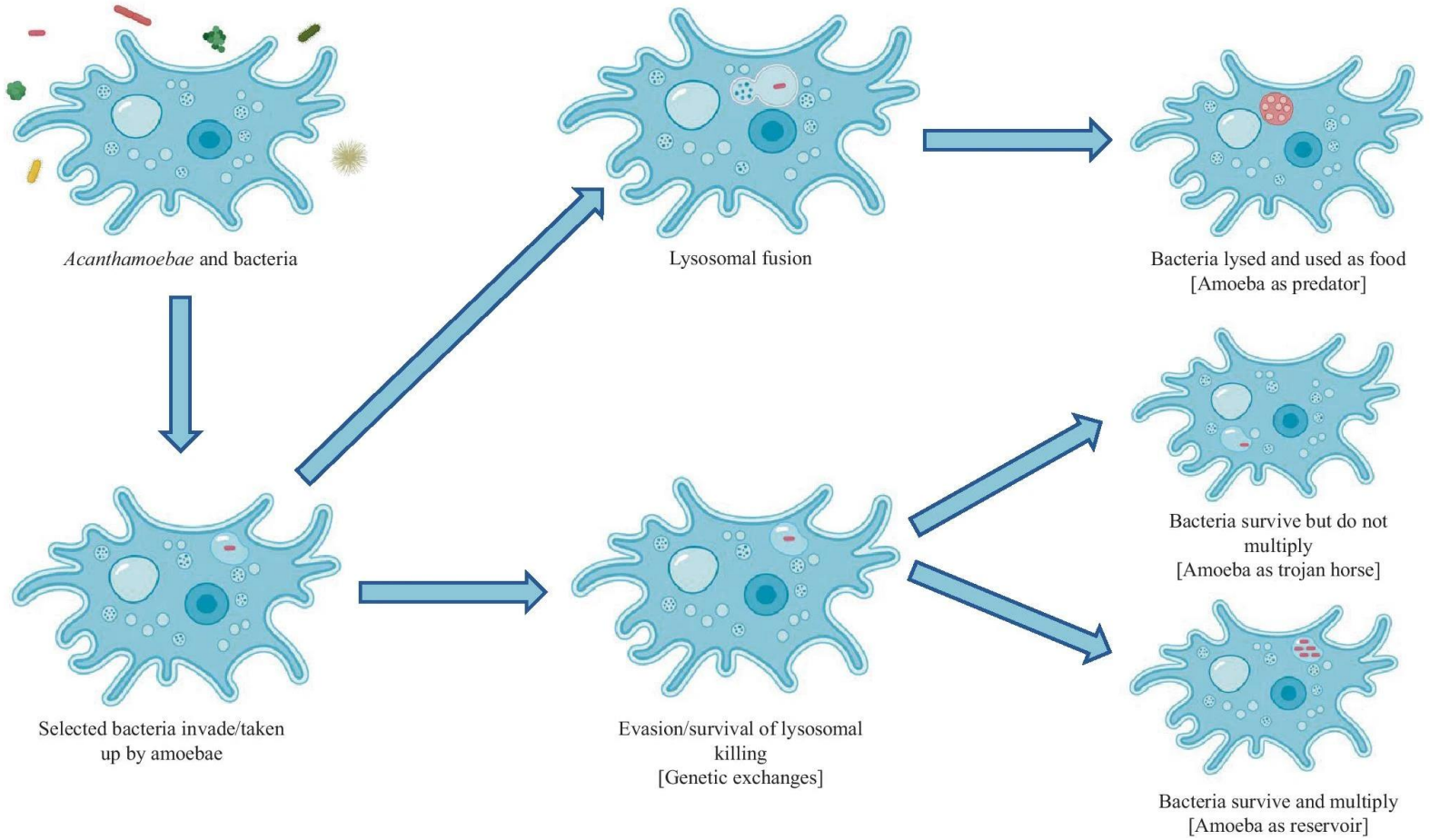
NTM in Drinking Water Systems

- NTM are pervasive in drinking water systems and are resistant to disinfection due to waxy cell walls.
- Growth in amebae amplify numbers.
- Aerosolization associated with pulmonary and post-operative infections.
- *M. abscessus* is highly antibiotic-resistant leaving few therapeutic options.
- Linking NTM infections to water sources is difficult and requires further study.

Dowdell K, et al; Nontuberculous mycobacteria in drinking water systems - the challenges of characterization and risk mitigation. Curr Opin Biotechnol. 2019 Jun;57:127-136.

Ecology of Environmental (Non-tuberculous) Mycobacteria

- Free-living mycobacteria live in wet soil, or stagnant water in contact with soil and are washed into rivers and lakes and potentially public water supplies.
- NTM and Legionella pneumophila participate in biofilms and can survive in amoeba resulting in amplification.



Mungroo, M.R., Siddiqui, R. & Khan, N.A. War of the microbial world: Acanthamoeba spp. interactions with microorganisms. Folia Microbiol 66, 689–699 (2021).

NTM Survival Mechanisms

- NTM possess waxy, “acid-fast” cell walls, making them hydrophobic and more readily aerosolized than other bacteria
- NTM can be “biofilm pioneers”, attaching to surfaces to establish disinfectant resistant biofilms,
- NTM can parasitize amoebae helping them survive and proliferate in drinking water systems and medical devices despite the presence of disinfectant residuals.

Dowdell, K. et al. Curr Opin Biotechnol. 2019 June ; 57: 127–136.

Identification and Quantification of NTM

- Identification and quantification of clinically-relevant NTM is difficult since unique cellular features and lifestyles make NTM and their nucleic acids difficult to recover.
- NTM identification strategies include NTM-specific media and that target NTM-specific proteins, lipids, or nucleic acids.
- 16S rRNA methods have limited value to identify species, subspecies or strains.
- There are currently no practical screening methods for quantifying NTM in water used for dental treatment.

Dowdell, K. et al. Curr Opin Biotechnol. 2019 June ; 57: 127–136.

Other Suspected Transmissions Associated with Dental Unit Waterlines

- *Pseudomonas aeruginosa*[1]
  - Britain 1987: Two immune compromised patients developed gingival infection following dental treatment.
  - Clinical samples type-matched to bacteria recovered from dental unit water.
- Legionella
  - Italy 2012: 82 year-old woman died from pneumonia traced to dental treatment water[2]
  - Sweden 2017: Elderly man died from exposure via contaminated cup filler[3]

[1] Martin, MV, *British Dental Journal*. 1987. 163, 152–154,

[2] Ricci ML, et al. *Lancet*. 2012;379(9816):684;

[3] Schonning et al. *Hosp Infect*. 2017 May;96(1):89-9

Dental Unit Waterlines and Biofilm

- Microbial biofilms form in narrow- bore tubing of dental units.
- Biofilms serve as a microbial reservoir.
- Primary source of microorganisms is municipal water supply.

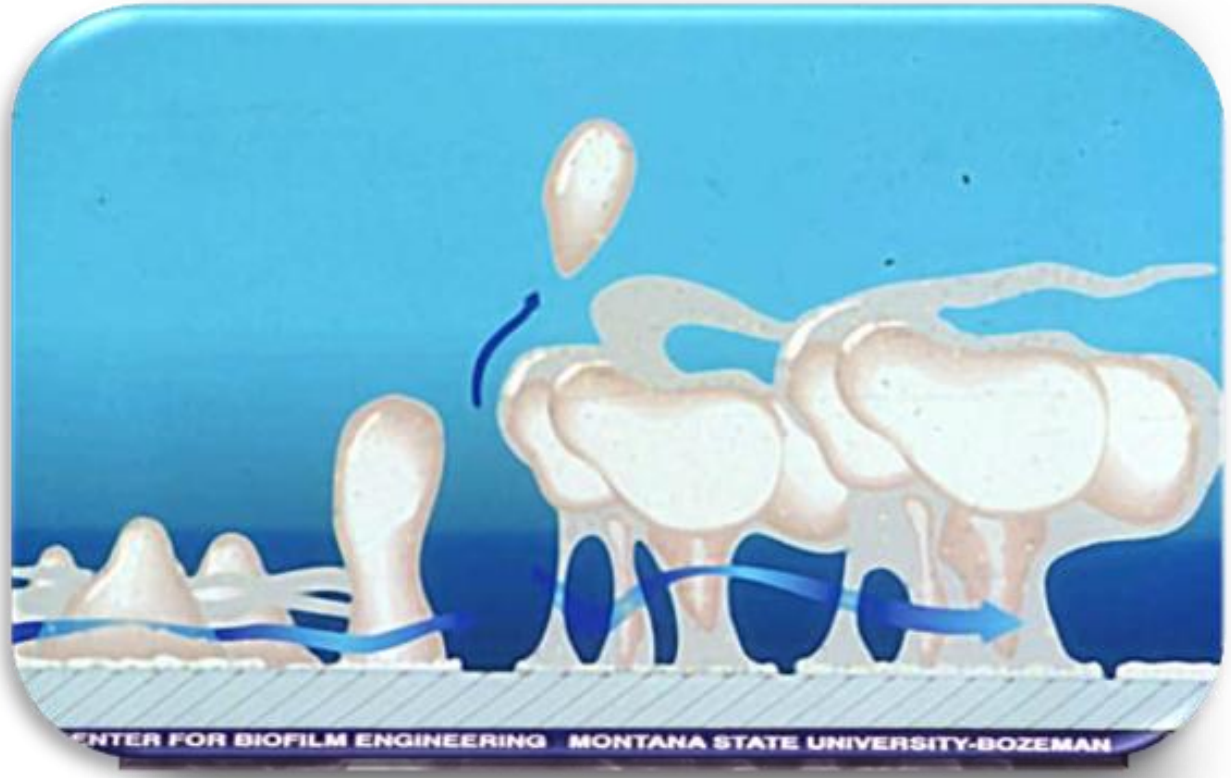


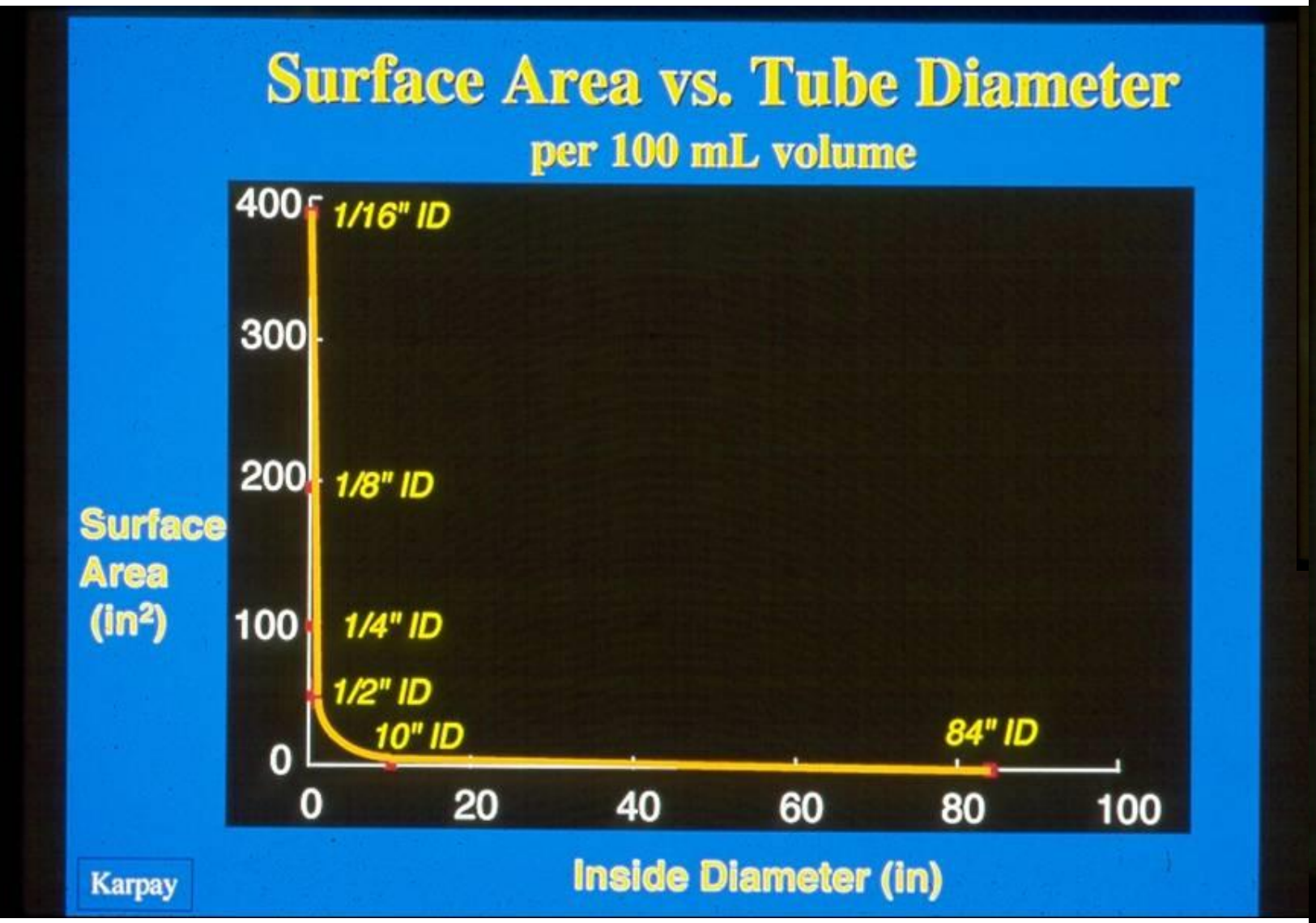
Photo credits: Top: US Air Force
Bottom: Center for Biofilm Engineering, Montana State University-Bozeman

Dental Unit Waterlines and Biofilm

- Dental unit design characteristics promote bacterial growth and development of biofilm:
  - Materials conducive to bacterial attachment
  - Low flow rates
  - Dead legs, control blocks and other areas that limit exposure to antimicrobial agents

Photo credit: Dr Richard Karpay

Dental Unit Waterlines and Biofilm Surface to Volume Ratio



CDC Guidelines 2003

Dental Unit Waterlines and Water Quality

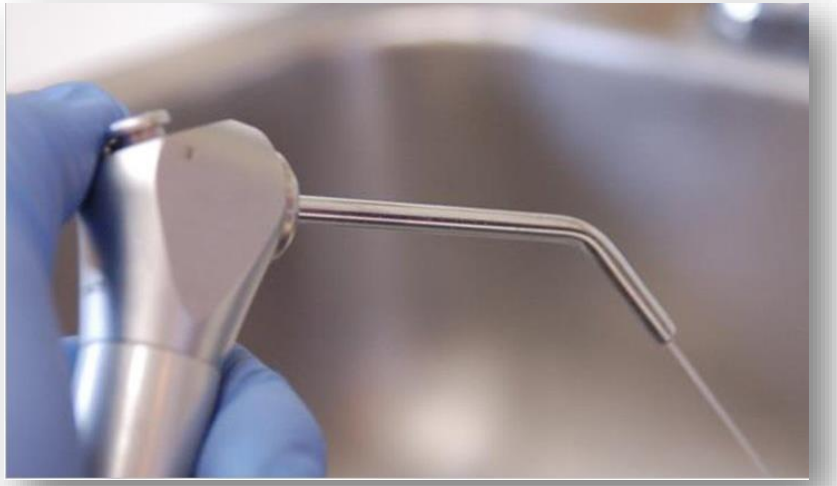
- For non-surgical treatment use water that meets EPA drinking water standards

  (> 500 CFU/ml of HPC bacteria)
- Consult with dental unit manufacturer for appropriate methods to maintain dental water quality
- Follow manufacturer recommendations for monitoring water quality

MMWR Recomm Rep. 2003 Dec 19;52(RR-17):1-61.

CDC Guidelines 2003
Dental Unit Waterlines and Water Quality

- Discharge water and air for a minimum of 20–30 seconds after each patient, from any device connected to the dental water system that enters the patient's mouth (e.g., handpieces, ultrasonic scalers, air or water syringes).
- Consult with the dental unit manufacturer on the need for periodic maintenance of antiretraction mechanisms.



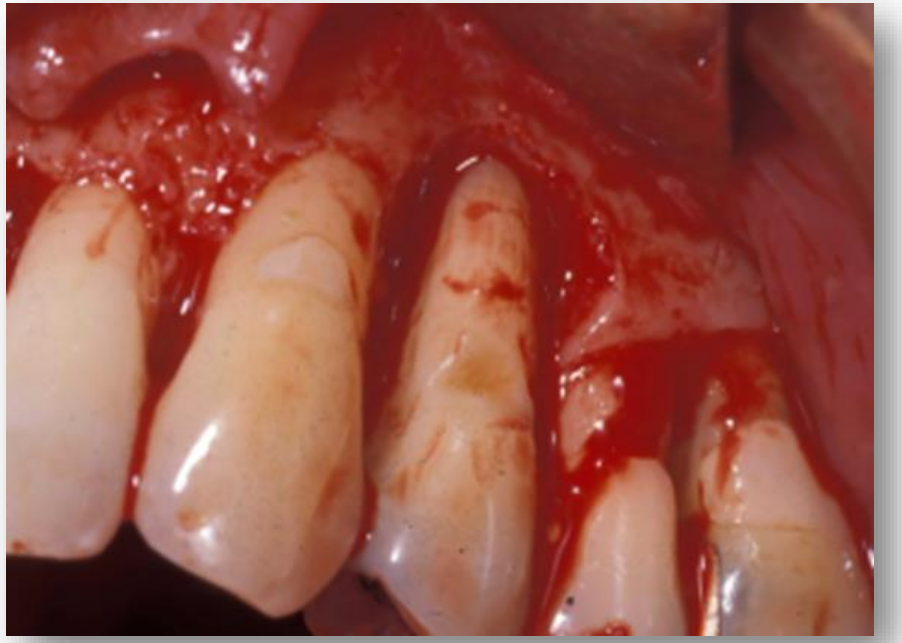
Dental Waterlines and Surgery

- Use sterile saline or sterile water as a coolant/irrigator when performing surgical procedures
- Use devices specifically designed for the delivery of sterile irrigating fluids

Surgery Definition – 2003 Guideline

- The incision, excision, or reflection of tissue that exposes the normally sterile areas of the oral cavity

- Examples:
  - Biopsy
  - Periodontal surgery
  - Apical surgery
  - Implant surgery
  - Surgical extractions requiring flap reflection, manipulation of bone or sectioning



CDC

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Infection Prevention Checklist for Dental Settings

Basic Expectations for Safe Care

Centers for Disease Control and Prevention
National Center for Chronic Disease Prevention and Health Promotion

CDC Infection Control Checklist

I.12 Dental Unit Water Quality

Elements To Be Assessed	Assessment	Notes/Areas For Improvement
A. Policies and procedures are in place for maintaining dental unit water quality that meets Environmental Protection Agency (EPA) regulatory standards for drinking water (i.e., ≤ 500 CFU/mL of heterotrophic water bacteria) for routine dental treatment output water	❑ Yes ❑ No	
B: Policies and procedures are in place for using sterile water as a coolant/irrigant when performing surgical procedures **Note:** *Examples of surgical procedures include biopsy, periodontal surgery, apical surgery, implant surgery, and surgical extractions of teeth.*	❑ Yes ❑ No	
C. Written policies and procedures are available outlining response to a community boil-water advisory	❑ Yes ❑ No	

Journal of Dental Infection Control & Safety - 2018

OSAP.org
The Safest Dental Visit™

https://osapjdics.scholasticahq.com/article/5075-dental-unit-water-quality-organization-for-safety-asepsis-and-prevention-white-paper-and-recommendations-2018

Dental Unit Water Quality: OSAP White Paper and Recommendations – 2018

- Purpose:
  - Provide guidance for the manufacturers of dental units, dental water treatment devices and chemical agents to meet or exceed CDC recommendations
  - Comply with federal and state regulatory/registration requirements
  - Provide recommendations for managing dental procedural water quality to meet or exceed current CDC recommendations to ensure the health and safety of patients and DHCPs
  - Provide recommendations regarding the adoption of voluntary consensus standards related to dental procedural water quality

Dental Unit Water Quality: OSAP White Paper and Recommendations – 2018

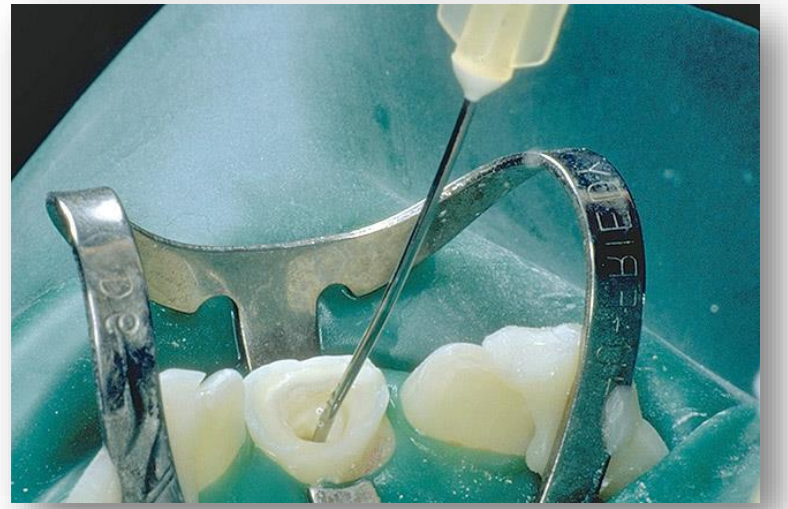
- OSAP concurs with the 2003 CDC guidelines for environmental infection control in health-care facilities but does not provide specific guidance on:
  - The design, monitoring and remediation of water contamination in premise plumbing
  - The quality of water delivered by publicly owned water treatment works.
  - Dental vacuum systems and amalgam separators.

OSAP White Paper: Use of Sterile Irrigating Solutions

- Use sterile irrigating solutions (water or saline) that conform to United States Pharmacopeia (USP) standards.
- Consider sterile water or saline for all dental extractions other than exfoliating deciduous teeth.
- Consider use of sterile irrigating solutions for non-surgical periodontal therapy based on extent of exposure of the vascular system and patient's immune status

OSAP White Paper: Use of Sterile Irrigating Solutions for Non-Surgical Endodontic Procedures

- Procedural water that meets CDC recommendations for microbial quality is acceptable for adult or pediatric pulp chamber initial access.
- Use sterile water, sterile saline solutions and/or antimicrobials such as diluted sodium hypochlorite during manipulation, amputation and/or debridement of pulp tissue.
- Irrigate with a sterile and/or antimicrobial solution prior to interim or final closure.



AAPD Guidance 2022

AMERICA'S PEDIATRIC DENTISTS
THE BIG AUTHORITY on little teeth®

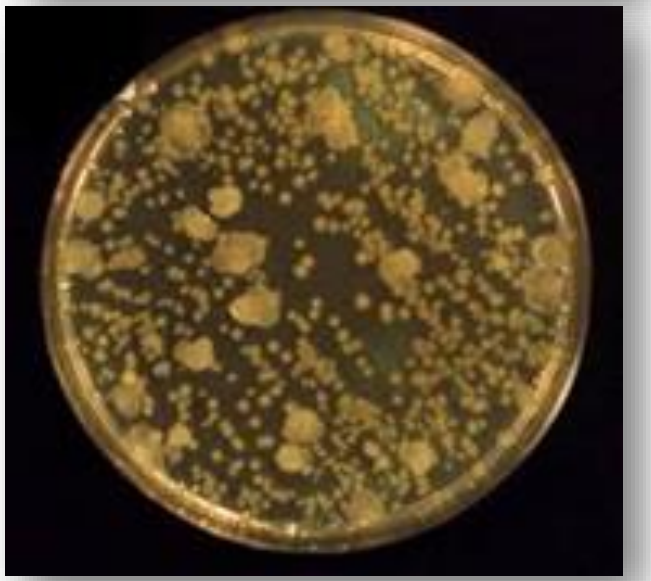
- When a pulp exposure occurs and pulp therapy is indicated, irrigants should not come from dental unit water lines. [1,2]
- A single-use disposal syringe should be used to dispense irrigants for pulpal therapy. [1,2]
- For partial pulpotomy for carious exposures bleeding must be controlled by irrigation with a bacteriocidal agent such as sodium hypochlorite or chlorhexidine.[2]

1. American Academy of Pediatric Dentistry. Policy on infection control. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2022:190-2.
2. American Academy of Pediatric Dentistry. Pulp therapy for primary and immature permanent teeth. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2022:415-23.

Clinical Monitoring

- Dental water monitoring can identify failures in clinical water management and provides a positive-reinforcement feedback for dental staff.

- CDC recommended 500 cfu/ml for non-surgical dental procedures serves as an action limit for treatment as directed by the device manufacturer IFU.



Why 500 CFU/mL?

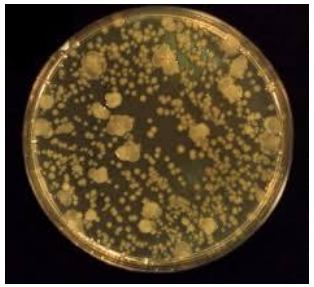
- Heterotrophic plate count (HPC) methods measure common bacteria water and do not provide a measure of health effects.
- HPC shows how well maintained a drinking water system is and there is no maximum contaminant level (MCL).
- Unlike DUWL, biofilm elimination is not a goal of drinking water management.

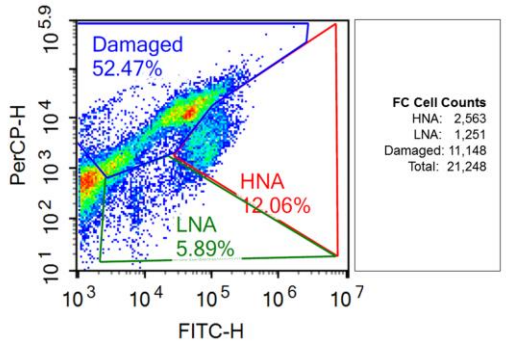
Why 500 CFU/mL?

- 500 CFU/mL limit for DUWL is not a threshold limit for the avoidance of adverse health outcomes but is a useful measure of process effectiveness.
- The goal of dental water management is to control biofilm to provide water with the lowest reasonably achievable numbers of bacteria when tested using standard drinking water test methods.
- Faster and more accurate test methods may be adopted as new technologies become available.
- Current test methods for NTM are insufficiently reliable for routine testing of dental water quality.

Clinical Monitoring

- Monitoring methods:
  - Water-testing laboratory services
  - In-office, chairside kits
  - Flow Cytometry
- Follow dental unit manufacturer and/or monitoring product IFU
- Monitoring should follow American Water Works Association (AWWA) Standard Methods





Graph generated from NovoCyte flow cytometer. Water sample from a dental chair contains high quantities of microbes. Total counts are a sum of HNA, LNA, and damaged. According to the new FC protocol, this would fail.

Clinical Monitoring

- Laboratory testing:
  - Spread plate R2A agar method (9215C) or Membrane filtration method (9215D) from AWWA *Standard Methods for the Evaluation of Water and Wastewater*
  - Incubate for 5-7 days at ~25° C to allow growth of slow-growing water bacteria
  - Follow laboratory instructions for aseptic collection, germicide neutralization and shipping/transport of samples
  - Samples may be collected from individual lines or by combining samples from a dental unit
  - If pooled samples exceed 500 CFU/ml, retest individual lines

Clinical Monitoring

- OSAP recommends that periodic monitoring and inspection **at least monthly** following installation of new units, treatment devices or initiation of new protocols.

- When monitoring shows acceptable counts for two consecutive monthly cycles, frequency of testing may be reduced, **but should not be less than every three months**.

- When a dental unit exceeds the action limit, treat according to manufacturer IFU, and re-test after treatment.

Options for Water Management

- Independent reservoirs
- Chemical treatment
  - Continuous
  - Intermittent (Shock)
- Water treatment devices
- Antimicrobial tubing and or reservoirs
- Combined approaches

Options for Water Management

- Independent Reservoirs
  - Most economical option
  - Useless without chemical treatment!
  - Follow manufacturer IFU for:
    - Acceptable agents: Tablets, liquids, cartridges (“straws”)
    - Frequency of treatment
    - Shock vs continuous germicide
  - Disinfect reservoirs and use aseptic technique when handling
  - Use source water of acceptable quality

Options for Water Management

- In-Line Water Treatment Devices
  - Treat incoming municipal water
  - Automate water treatment process using germicide impregnated resins (Iodine or silver) and/or antimicrobial surfaces
  - Some devices also filter and condition water
  - Components require replacement at least annually

Source Water Options

- Source water treatment or polishing (these require routine preventive maintenance to maintain water quality)
  - Reverse Osmosis system
  - Distillation
  - Deionization
  - Germicidal UV
  - Filtration

- No matter how clean input water is, recurring shock treatment or continuous germicide is necessary to suppress biofilm formation
- Do not connect units to potable water without treatment device!

Source Water Options

- Sources of water for independent reservoirs
  - Sterile water for irrigation (USP)
  - Sterile water (autoclaved)
  - Commercial bottled drinking water
  - Freshly boiled water

Drinking Water Advisories

- Dental units connected to municipal water during advisories cannot be used and must be thoroughly disinfected and tested before return to service.
- Dental units isolated from municipal water may used during the emergency and do not require additional disinfection.

Flint Michigan

Jackson Mississippi

Summary

- Follow CDC guidelines and manufacturer instructions for devices that provide water for dental treatment
- Use sterile water or saline with a sterile delivery system for surgical procedures
- After initial access, use sterile water or antimicrobial solutions for pulpal procedures
- Isolate dental water systems from municipal water supplies using:
  - Independent water reservoirs
  - Water treatment devices

Summary

- For dental units currently supplied by municipal water:
  - Shock treat the lines to remove existing biofilm or
  - Replace biofilm contaminated lines with new tubing
- Monitor water quality at least quarterly to ensure best results
  - Use drinking water standard testing methods
  - Do not routinely test for NTM or other specific organisms except to investigate a site infection or outbreak
- Report suspected waterborne infection to public health agencies

References and Resources

- Guidelines for Infection Control in Dental Health-Care Settings, 2003. *MMWR*, December 19, 2003:52(RR-17)
- CDC Summary of Infection Prevention Practices in Dental Settings: Basic Expectations for Safe Care: https://www.cdc.gov/oralhealth/infectioncontrol/summary-infection-prevention-practices/index.html
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References and Resources

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Questions

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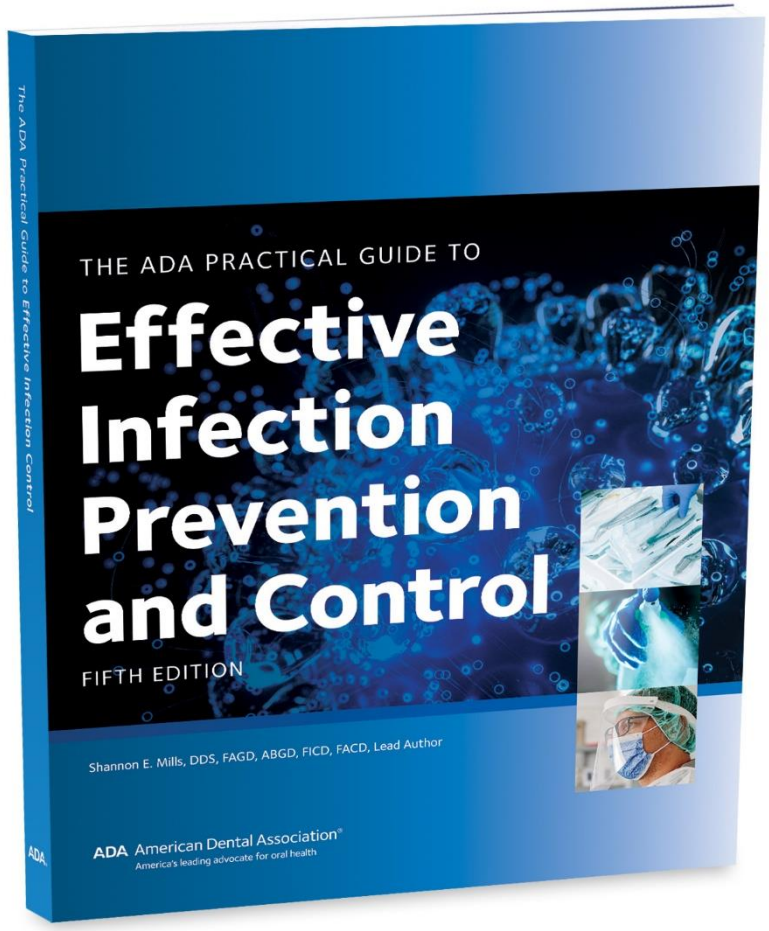
The ADA Practical Guide to Effective Infection Prevention and Control, Fifth Edition



- Updated in 2022
- Features new chapters on Dental Water Quality and Pandemic Preparedness
- Includes a self-assessment checklist of current infection control practices
- Designed for use by all dental health care personnel, including dentists, hygienists, assistants, dental laboratory technicians, and administrative staff to contribute to building a culture of safety in the dental office.